CLASS 701, DATA PROCESSING: VEHICLES, NAVIGATION, AND RELATIVE LOCATION

SECTION I - CLASS DEFINITION

This class provides for electrical computers, digital data processing systems, and data processing processes for transferring data between a plurality of computers or processes wherein the computers or processes employ the data before or after transferring and the employing affects the transfer of data therebetween. More specifically, this class provides for the following subject matter:

A. This class is for electrical apparatus and corresponding methods for performing data processing operations in which there is a significant change in the data or for performing calculation operations wherein the electrical data processing system or calculating computer functions to indicate a condition of a vehicle, to regulate the movement of a vehicle, to monitor the operation of a vehicle, or to solve a diagnostic problem with the vehicle.

B. This class also provides electrical apparatus and corresponding methods wherein the electrical data processing system or calculating computer function to determine the course, position, or distance traveled.

C. This class further provides electrical apparatus and corresponding methods wherein the electrical data processing system or calculating computer functions to determine the relative location of an object (e.g., person or vehicle) and may include communication of the determined relative location to a remote location.

Class 701 is structured into three main divisions:

A. Vehicle control, guidance, operation or indication.

B. Navigation.

C. Relative location.

See Subclass References to the Current Class, below, for the location of subclasses for each of the main divisions.

SECTION II - LINES WITH OTHER CLASSES AND WITHIN THIS CLASS

A. VEHICLE CONTROL, GUIDANCE, OPERATION, OR INDICATION

1. This class includes subject matter directed to significant data processing or calculation in determining the control, monitoring, guidance, and condition for one or more of the components or subsystems associated with a vehicle.

2. This class does not include subject matter wherein significant details of the mechanical construction of the component or subsystem within a vehicle are disclosed and claimed. Examples of subject matter not included are detailed mechanical structure of a transmission, internal combustion engine, power steering, suspension, and braking systems, each in conjunction with a nominally recited computer implemented function. See Search Class notes below for appropriate class.

3. This class also does not include subject matter wherein the data processing or calculation is employed solely for the purpose of manipulating or controlling robotic arm movement. See Search Class notes below for Class 700.

B. NAVIGATION

1. This class is limited to significant data processing or calculating operation to provide navigation information to either a vehicle or an operator.

2. This class does not include subject matter wherein significant details of the display device and/or technique in displaying the determined navigation information are disclosed and claimed. See the Search Class notes below in References to Other Classes for Class 340.

C. RELATIVE LOCATION

1. This class includes subject matter directed to significant data processing or calculation for determining the relative location of an object and may include communicating the determined relative location to a remote location for further processing and/or use.

2. This class does not include subject matter wherein significant details of the communication device and/or the technique of communicating are disclosed and claimed. See the Search Class notes below in References to Other Classes for Classes 340 and 375.

SECTION III - SUBCLASS REFERENCES TO THE CURRENT CLASS

SEE OR SEARCH THIS CLASS, SUBCLASS:

1,   through 124, for vehicle control, guidance, operation or indication.

200,   through 226, for navigation.

300,   through 302, for relative location.

SECTION IV - REFERENCES TO OTHER CLASSES

SEE OR SEARCH CLASS:

33,   Geometrical Instruments, appropriate sub-classes, especially subclass 232 for aircraft or marine ground speed indicator, subclasses 268+ for celestial navigational instruments, subclasses 316+ for a magnetic field sensitive device (compass, flux valve) utilized to monitor a directional gyroscope by orienting the gyroscope in the direction of the magnetic meridian, and subclasses 318+ for a gyroscope utilized to (a) indicate direction or (b) maintain the equilibrium of a directional indicator or datum structure with respect to a reference plane (plurality of coordinates).

73,   Measuring and Testing, appropriate subclass for a process or apparatus for making a measurement of any kind or for making a test of any kind especially subclasses 11.04+ for the testing of a shock absorber device, subclasses 116+ for motor or engine testing, subclasses 121+ for brake testing excluding data processing techniques, and subclasses 178+ for navigational instruments.

74,   Machine Element or Mechanism, subclasses 473+ for a system to manually control a transmission.

91,   Motors: Expansible Chamber Type, subclass 473 for condition responsive control of a drive transmission.

92,   Expansible Chamber Devices, subclasses 12.1+ for displacement control of plural cylinders arranged in parallel, radial, or conical relationship with a rotary transmission axis.

104,   Railways, appropriate subclass for railway rolling stock and track, especially subclass 284 for sensing or controlling railway position or attitude with respect to a guide way.

105,   Railway Rolling Stock, appropriate subclass for wheeled transportation equipment for a railway, especially subclass 4.4 for train having a wheel steering provision and 453 for body suspension and springs.

116,   Signals and Indicators, subclass 31 for a vehicle steering wheel position indicator.

123,   Internal-Combustion Engine, subclasses 319+ for engine speed regulators responsive to vehicle acceleration or deceleration, subclasses 350+ for electrical sensing or regulating of engine speed, subclasses 395+ for an engine speed regulator responsive to (a) an engine parameter, or (b) an environmental condition to alter the present engine speed without regard to the resulting engine speed, subclasses 406.12+ for electronic spark ignition timing control, subclasses 406.24+, 406.59 for speed responsive engine control, subclasses 406.25, 406.36, 406.5+, 492, and 493 for acceleration/deceleration condition responsive means, subclasses 406.53+ and 491 for the starting or cold running condition of an engine, subclass 429 for a combustion chamber means combined with air-fuel mixture forming means, subclasses 438+ for a charge forming device which includes an electronic control system for carburetor fuel metering, subclasses 478+ for a fuel injection system having an actuator circuit (e.g., engine condition responsive electronic circuit actuates injector valve), subclass 479 for backup and fail-safe systems, subclass 480 for fuel injection which includes a microprocessor, subclass 486 for digital memory addressed by an engine parameter, subclasses 531+ for a charge forming device using auxiliary air or gas to inject fuel, subclasses 568.21+ for the electrical control of an e.g.r. valve for a charge forming device, subclasses 575+ for a means of forming a mixture of a diverse supply of fuel and an oxidant, subclasses 585+ for a charge forming device having auxiliary air or oxygen added to combustible mixture, subclasses 672+ for exhaust gas sensing, and subclass 690 for a charge forming device with fail-safe, backup, or malfunction means including an exhaust gas condition responsive means.

180,   Motor Vehicles, appropriate subclasses for control devices in combination with vehicle structure especially subclasses 6.2+ for steering by driving systems, subclasses 65.1+ for electric vehicles, per se, subclasses 167+ for a motor vehicle with a means for controlling an operation responsive to electromagnetic radiation, magnetic force, or sound waves received from a source, or reflected from an object or surface, located apart from vehicle, subclasses 170+ for speed responsive means combined with vehicular structure, subclass 197 for anti-

spin, traction control, and antiskid/antilock systems combined with vehicular structure, subclasses 234+ for steering of four wheel drive vehicles, subclasses 271+ for a vehicle with means for promoting safety of vehicle, its occupant, or load, or an external object, steering; subclass 315 for manually controlling the motor or driving mechanism with transmission control, subclasses 337+ for a vehicle drive train or transmission, subclass 408 for a vehicle having each wheel steerable, subclasses 421+ for condition modulated, and subclass 443 for electric power assist steering.

187,   Elevators, Industrial Lift Truck, or Stationary Lift for Vehicle, subclass 231 for industrial lift truck steering by a walking attendant and 343+ for cushioning contact of load support.

188,   Brakes, appropriate subclasses for brake control which includes specific structure to the brakes especially subclass 350 for brakes in combination with a steering gear control.

192,   Clutches and Power-Stop Control, subclasses 3.51+ for transmission control and clutch control, subclasses 215+ for control of transmission and brake, and subclass 137 for a safety device in which the power-transmitting connections are disabled in response to the transmission guard striking an extraneous object.

244,   Aeronautics and Astronautics, subclasses 3.1 through 3.3 for missile control, 3.18 for celestial navigation, subclasses 17.17, 50, and 51 for aircraft steering, subclasses 75.1-99.9 for aircraft control, and subclasses 158.1-173.3 for spacecraft control.

246,   Railway Switches and Signals, subclasses 182+ for the automatic actuation of signals and changeable exhibitors upon the cab or train or for stopping it or controlling its speed, usually by cooperation with means not on the train, but not disclosing a complete block system having speed-control means which is inoperative below but operative above predetermined speeds when predetermined points are reached.

250,   Radiant Energy, subclasses 203.1+ for a means for illuminating a photocell in accordance with the relative position of the photoelectric cell and an object, and having means for causing the photoelectric cell to follow the object under the control of said illumination.

267,   Spring Devices, subclasses 2+ for vehicle spring suspension devices.

280,   Land Vehicles, appropriate subclasses, particularly subclasses 5.5+ for a general utility land vehicle including an active suspension system having a regulatable elastic means which is caused to alter its elasticity property in response to a force encountered while the vehicle is in surface traversing motion; subclasses 6.15+ for a general utility land vehicle including means, interposed between the vehicle body, chassis, or frame and running gear thereof, for altering height or levelness of the vehicle body, chassis, or frame; subclass 47.22 for a handle-propelled tiltable vehicle stabilized by the attendant or article and having a spring suspension; subclasses 124.1+ for a suspension arrangement for a general utility land vehicle, in particular subclasses 124.125+ for a land vehicle suspension arrangement including a wheel separately supported upon an individual stub axle; subclass 402 for a single end suspension of a transported articulated land vehicle; subclasses 676+ for a general utility land vehicle having an equalized frame, tandem axles, and a suspension arrangement; subclasses 734+ for an inflatable passenger restraint or confinement (e.g., air bag) or attachment responsive to a vehicle condition; subclasses 757+ for an attachment relating to antiskid or antislide; subclass 787 for a land vehicle frame of the single longitudinal beam type with spring suspension means; and subclass 788 for a land vehicle frame with resilient means for suspension.

303,   Fluid-pressure Brake and Analogous Systems, subclasses 22.6+ for railway vehicle load control, subclasses 122+ for speed-controlled vehicle with failure responsive means, subclasses 139+ for traction control which includes structure related to fluid-pressure brakes, subclass 141 for speed and traction control by regulating the engine torque, subclasses 146+ for yaw control which includes structure related to fluid-pressure brakes, subclasses 149 for speed control with a split coefficient of friction, 163 for speed control using a slip ratio as related to fluid-pressure brakes, and 167 for vehicle speed control by regulating brake pressure not having a positive recitation of data processing steps.

307,   Electrical Transmission or Interconnecting Systems, subclasses 9.1+ for vehicle mounted systems (e.g., safety devices).

318,   Electricity: Motive Power Systems, subclasses 580+ for vehicular guidance systems with single axis control using a positional servo system, subclass 582 for vehicular guidance systems with celestial navigation, and sub-

classes 588+ for marine vehicular guidance systems with single axis control.

340, Communications: Electrical, subclass 436 for a system designed to indicate contact between the vehicle and an external object, subclasses 438-462 for monitoring or solving diagnostic problems associated with vehicle operation, subclasses 453 and 454 for means responsive to vehicular brake conditions and indication thereof which exclude data processing techniques, subclass 465 for indicator of steering or turning, subclass 507 for a fail-safe responsive indicating system, subclass 903 for a vehicle collision alert system, subclasses 907-932.1 for electrical signaling in a vehicle or traffic environment, subclasses 933-943 for vehicle detectors, subclasses 945-983 for a flight condition indicating system excluding data processing technique, subclass 951 for airport landing guidance systems which do not include data processing techniques, subclasses 984-987 for nautical vehicle alarm or indicator, subclasses 988-996 for vehicle position indication, and subclass 990 and subclasses 995.1-995.28 for vehicle position indication with a map display.

342, Communications: Directive Radio Wave Systems and Devices, subclasses 1+ for radar navigation systems, 42+ for radar transmitter and receiver system, 71 for return control signal for braking or steering, 72 for safety device, 357 for sending or receiving radio wave energy which is characterized by some quality that varies according to the relative direction or position of a satellite used to locate the position of an object, 385+ for radio wave energy for direction finding receivers, and 450+ for an apparatus for determining the position in space of an object, vehicle or atmospheric condition by the reception of signals not having distinctive bearing or position determinative characteristics.

348, Television, subclasses 113+ for a picture signal generator or reproducer is used with a steerable vehicle to permit control of the vehicle from a remote location or to provide an indication in the vehicle of its position as an aid in the guidance of the vehicle.

353, Optics: Image Projectors, subclasses 11+ for a projector especially adapted to project an image of a map or navigation chart, an image of a target onto a map or chart, or a target which represents a vehicle such as an aircraft onto a screen.

356, Optics: Measuring and Testing, subclasses 3+ for optical range finders and 27+ for velocity or height measuring.

361, Electricity: Electrical Systems and Devices, subclass 238 for electrical speed signal circuitry used for antispin and antilock/antiskid detection and which does not include significant data processing.

365, Static Information Storage and Retrieval, appropriate subclass for particular memory device.

375, Pulse or Digital Communications, subclasses 219+ for transceivers, 237+ for modulation techniques, 295+ for transmitters, and 316+ for receivers.

382, Image Analysis, appropriate subclass for an apparatus or corresponding method for the automated analysis of an image or recognition of a pattern, especially subclass 104 for vehicle or traffic control.

434, Education and Demonstration, subclass 1 for training in the use of radar or sonar detecting or range finding, subclasses 30+ for aircraft training per se, and subclasses 111, 186, and 239+ relating to training or instructions in the area of navigation.

440, Marine Propulsion, subclass 53 for a means effecting or facilitating movement of propulsion unit or a segment of the propulsion unit (e.g., tilting or steering) and subclasses 84+ for engine, motor, or transmission control means.

441, Buoys, Rafts, and Aquatic Devices, appropriate subclass for structure or an attachment peculiar to a mooring buoy, marker buoy, container buoy, or other buoy; structure or an attachment peculiar to a raft, to rafting, and guiding of floating logs; water rescue apparatus or other aquatic devices.

475, Planetary Gear Transmission Systems or Components, subclass 43 for a transmission with speed or torque responsive clutch.

477, Interrelated Power Delivery Controls Including Engine Control, subclass 5 and 6 for plural engines having clutch control, subclass 8 for an electric engine with clutch control, subclasses 15+ for an electric engine with transmission control, subclass 31 for continuously variable transmission with a gas turbine engine, subclasses 34+ wherein the operation of an engine regulates or is regulated by the operation of a transmission, subclass 39 for a continuously variable friction transmission with clutch control, subclasses 57, 62, and 70+ for transmission control and clutch control, subclasses

166+ for clutch control, per se, and 182+ for engine brake control responsive to engine speed.

700,   Data Processing: Generic Control Systems or Specific Applications, subclasses 245 through 264 for robotic arm control.

706,   Data Processing: Artificial Intelligence, appropriate subclasses for artificial intelligence, in general, including cross-reference art collections 905 and 913 for application of detailed artificial intelligence to vehicle control or diagnostics.

714,   Error Detection/Correction and Fault Detection/Recovery, subclasses 799+ for general testing of programming digital data systems.

SECTION V - GLOSSARY

The terms below have been defined for purposes of classification in this class and are shown in underlined type when used in the class and subclass definitions. When these terms are not underlined in the definitions, the meaning is not restricted to the glossary definitions below.

ANTILOCK OR ANTISKID

A process of controlling a vehicle to enhance the braking performance during deceleration of the vehicle by manipulating the brake pressure.

ANTISPIN

A process of controlling a vehicle to enhance the driveability of the vehicle during starting or acceleration of the vehicle by manipulating at least one of (1) brake pressure, (2) engine torque, and (3) transmission torque.

ARTIFICIAL INTELLIGENCE (AI)

Computer emulation of aspects of human intelligence such as speech recognition, deduction, inference, creative response, the ability to learn from past experience, and the ability to make reasonable inferences from incomplete information. Examples of AI include expert systems, neural networks, and fuzzy logic.

ATTITUDE

Orientation of a vehicle with respect to a reference plane. An example in an automobile would be orientation of the vehicle body relative to the road surface

whereas in aeronautics it may define the orientation of the aircraft relative to the earth.

BRAKE-SLIP

The slippage of a wheel caused by the braking operation during deceleration of the vehicle.

CALCULATING OPERATIONS

Arithmetic and/or some limited logic operations performed upon or with signals representing numbers or values.

DATA PROCESSING

For the purpose of this class, data processing is defined as a systematic operation on data in accordance with a set of rules which results in a significant change in the data.

DRIVE SLIP

The slippage of a wheel caused by the driving condition during acceleration of the vehicle.

FUZZY LOGIC

A form of AI in which variables can have degrees of truthfulness or falsehood represented by a range of values between 1 (true) and 0 (false). The outcome of an operation using fuzzy logic can be expressed as a probability rather than as a certainty (e.g., inexact reasoning).

NAVIGATION

The determination of a course, position, or distance traveled.

SLIP

Loss of adhesion or friction between an object and a surface. An example in a vehicle would be the reduction of friction between a wheel and a road surface (e.g., wheel slippage).

VEHICLE

Any means in or by which someone or something is carried or conveyed. This term includes, but is not limited to, automobiles, aircraft, spacecraft, blimps, trains, motorcycles, bicycles, watercraft, and submarines.

SUBCLASSES

1 VEHICLE CONTROL, GUIDANCE, OPERATION, OR INDICATION:
This subclass is indented under the class definition. Subject matter wherein the electrical data processing system or calculating computer functions to indicate a condition or position of a vehicle, to regulate the movement of a vehicle, to monitor the operation of a vehicle, or to solve a diagnostic problem with the vehicle.

SEE OR SEARCH THIS CLASS, SUBCLASS:
200+, for navigational systems, per se.

SEE OR SEARCH CLASS:
180, Motor Vehicles, for control devices in combination with vehicle structure.
318, Electricity: Motive Power Systems, subclasses 580+, for vehicular guidance systems with single axis control.
340, Communications: Electrical, subclasses 22+ for electrical signaling in a vehicle or traffic environment, 438+ for monitoring or solving diagnostic problems associated with vehicle operation.
703, Data Processing: Structural Design, Modeling, Simulation, and Emulation, subclass 8 for computer to simulate a vehicle.

2 Remote control system:
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein regulation of the vehicle is based on a signal transmitted from a location not physically connected to, but received by, the system or computer.

3 Aeronautical vehicle:
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the electrical data processing system or calculating computer is designed to control, guide, or operate an airborne or space vehicle (e.g., helicopter, airplane, spacecraft, blimp, etc.).

SEE OR SEARCH CLASS:
244, Aeronautics and Astronautics, subclasses 3.1 through 3.3 for missile control, subclasses 158-173.3 for spacecraft control, and subclasses 75-99.9 for aircraft control.

4 Altitude or attitude control or indication:
This subclass is indented under subclass 3. Aeronautical vehicle control or indication wherein the data processing system or calculating computer functions to control or maintain the orientation of an airborne or space vehicle with respect to a reference plane.

5 Rate of change (e.g., ascent, descent):
This subclass is indented under subclass 4. Altitude or attitude control or indication wherein the data processing system or calculating computer is designed to control or indicate change in the orientation of an aeronautical vehicle as a function of time.

SEE OR SEARCH THIS CLASS, SUBCLASS:
16+, for the control or indication of a vehicle or its function as it performs the act of landing (e.g., engaging the ground).

6 Angle of attack:
This subclass is indented under subclass 5. Rate of change control or indication wherein the data processing system or calculating computer is designed to control or indicate a specified angular relationship defined as the acute angle between the chord of an airfoil and the line of relative air flow or horizontal.

7 Air speed or velocity measurement:
This subclass is indented under subclass 4. Altitude or attitude control or indication further comprising a means to determine vehicle airspeed.

SEE OR SEARCH CLASS:
73, Measuring and Testing, appropriate subclass for a process or apparatus for making a measurement of any kind or for making a test of any kind.

8 Threshold or reference value:
This subclass is indented under subclass 4. Altitude or attitude control or indication further comprising a predetermined or operator determined altitude or attitude setting.

9 Warning signal or alarm:
This subclass is indented under subclass 8. Altitude or <u>attitude</u> control or indication further comprising a means to alert the aeronautical <u>vehicle</u> operator of a condition relative to the predetermined or operator determined altitude or <u>attitude</u> setting.

10 Compensation for environmental conditions:
This subclass is indented under subclass 4. Altitude or <u>attitude</u> control or indication further comprising meteorological correction means.

11 Auto pilot:
This subclass is indented under subclass 4. Altitude or <u>attitude</u> control or indication further comprising an automatic flight control system.

12 Inner/outer loop:
This subclass is indented under subclass 11. Automatic flight control system further comprising a stability control loop (i.e., inner loop) which controls the <u>attitude</u>, or altitude of the aeronautical <u>vehicle</u>, with respect to <u>attitude</u> or altitude reference signals provided by a full pilot authority control loop (i.e., outer loop).

13 Spacecraft or satellite:
This subclass is indented under subclass 4. Altitude or <u>attitude</u> control or indication specific to an aeronautical <u>vehicle</u> adapted to be placed in an orbit or which substantially operates outside the earth's atmosphere.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
226,   for the <u>navigation</u> of a <u>vehicle</u> within a space orbit or path,

14 Flight condition indicating system:
This subclass is indented under subclass 3. Aeronautical <u>vehicle</u> wherein a condition significantly affecting aircraft flight is indicated.

(1)   Note. Included here are such conditions as wind shear, air speed, etc.

(2)   Note. Excluded here is altitude indication.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
4+,   for altitude indication of an aircraft.

SEE OR SEARCH CLASS:
340,   Communication: Electrical, sub-classes 945+ for a flight condition indicating system excluding <u>data processing</u> technique.

15 With indication or control of take-off:
This subclass is indented under subclass 3. Vehicle control, guidance, operation, or indication wherein the data processing system or calculating computer controls, indicates, or monitors the vehicle or its functions as it performs the intended act of disengaging from the ground.

SEE OR SEARCH CLASS:
73,   Measuring and Testing, subclass 178 for takeoff and landing monitors.

16 With indication or control of landing:
This subclass is indented under subclass 3. Vehicle control, guidance, operation, or indication wherein the data processing system or calculating computer controls, indicates, or monitors the vehicle or its functions as it performs the intended act of engaging the ground.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
5,   for the indication or control of the altitude or <u>attitude</u> rate of change for an aeronautical <u>vehicle</u>.

SEE OR SEARCH CLASS:
73,   Measuring and Testing, subclass 178 for takeoff and landing monitors
340,   Communications: Electrical, sub-classes 933+ for <u>vehicle</u>s which are controlled by traffic conditions.

17 I.L.S. or radar guidance:
This subclass is indented under subclass 16. Indication or control of landing wherein an instrument landing system or radio detecting and ranging equipment are employed.

SEE OR SEARCH CLASS:
343,   Communications: Radio Wave Antennas, subclasses 5+ for radar transmitter and receiver.

18   Profile of descent:
This subclass is indented under subclass 16. Indication or control of landing wherein the characteristic of the vehicle's ground approach, such as a glide slope, is employed.

19   Railway vehicle:
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the electrical data processing system or calculating computer is designed to control, guide, or operate a vehicle, or its components, confined to a predetermined path defined by a track or rail.

(1)   Note. This subclass does not include art wherein the railway speed or velocity is controlled. See search note below.

SEE OR SEARCH CLASS:
33,   Geometrical Instruments, subclasses 287, 338, 532.1, and 651 for indication means.
104,   Railways, appropriate subclass for railway rolling stock and track.
105,   Railway Rolling Stock, appropriate subclass for wheeled transportation equipment for a railway.
246,   Railway Switches and Signals, subclasses 182+ for railway vehicle speed control systems.
295,   Fluid-pressure Brake and Analogous Systems, subclasses 22.6+ for railway vehicle load control.

20   Railway vehicle speed control:
This subclass is indented under subclass 19. Railway vehicle wherein the electrical data processing system or calculating computer functions to regulate the velocity of a vehicle confined to a track or rail.

SEE OR SEARCH CLASS:
246,   Railway Switches and Signals, especially subclass 182 for train speed control means which are actuated by agencies not on the train or by wheel

derailment or defects in train structure and mechanism.

21   Marine vehicle:
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the electrical data processing system or calculating computer is designed to control, guide, or operate a vehicle designed for water traffic.

SEE OR SEARCH CLASS:
33,   Geometrical Instruments, subclass 232 for a marine speed indicator.
318,   Electricity: Motive Power Systems, subclass 588, for marine vehicular guidance systems with single axis control.
440,   Marine Propulsion, especially subclass 84 for engine, motor, or transmission control means.
441,   Buoys, Rafts, and Aquatic Devices, appropriate subclass for structure or an attachment peculiar to a mooring buoy, marker buoy, container buoy, or other buoy; structure or an attachment peculiar to a raft, to rafting, and guiding of floating logs; water rescue apparatus or other aquatic devices.

22   Electric vehicle:
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the electrical data processing system or calculating computer is designed to control, guide, or operate a vehicle wherein the prime mover is powered by an electrical current.

SEE OR SEARCH CLASS:
180,   Motor Vehicles, subclasses 65.1+ for electric vehicles, per se.
318,   Electricity: Motive Power Systems, subclasses 139+ for a motor generator used in an electric vehicle.

23   Automatic route guidance vehicle:
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the electrical data processing system or calculating computer is designed to control, guide, or operate an autonomous or unmanned vehicle (e.g., AGV).

SEE OR SEARCH THIS CLASS, SUB-CLASS:

200+,   for a <u>navigational</u> system.

SEE OR SEARCH CLASS:

180,   Motor Vehicles, subclasses 167+ for a motor <u>vehicle</u> with a means for controlling an operation responsive to electromagnetic radiation, magnetic force, or sound waves received from a source, or reflected from an object or surface, located apart from <u>vehicle</u>.

318,   Electricity: Motive Power Systems, subclasses 580+ for a vehicular guidance systems with single axis control using a positional servo system.

348,   Television, subclasses 113+ for a picture signal generator or reproducer used with a steerable <u>vehicle</u> to permit control of the <u>vehicle</u> from a remote location or to provide an indication in the <u>vehicle</u> of its position as an aid in the guidance of the <u>vehicle</u>.

24   On-board computer interact with a host computer:
This subclass is indented under subclass 23. Automatic route guidance <u>vehicle</u> having two processing units, one of which is the primary controller communicating with a second controller physically mounted to the <u>vehicle</u>.

25   Storage or planning of route information:
This subclass is indented under subclass 23. Automatic route guidance <u>vehicle</u> wherein the electrical <u>data processing</u> system or calculating computer is also capable of retaining in a memory device a path of travel or developing a path of travel.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

202,   for a static means to determine a travel course prior to the departure of the <u>vehicle</u>.

26   Modification or correction of route information:
This subclass is indented under subclass 25. Planned or stored route information wherein the electrical <u>data processing</u> system or calculating computer is further capable of manipulating data associated with a traveled path to alter the <u>vehicle</u>'s route.

27   Artificial intelligence (e.g., fuzzy logic):
This subclass is indented under subclass 23. Automatic route guidance <u>vehicle</u> wherein the electrical <u>data processing</u> system or calculating computer is designed to control, guide, or operate the <u>vehicle</u> by the logical manipulation of a value of a predetermined function of antecedent and consequent operations corresponding to the coordinate location of the <u>vehicle</u>.

SEE OR SEARCH CLASS:

706,   Data Processing: Artificial Intelligence, appropriate subclasses for artificial intelligence, in general, including cross-reference art collections 905 and 913 for detailed artificial intelligence applied to vehicle control or diagnostics.

28   Having image processing:
This subclass is indented under subclass 23. Automatic route guidance <u>vehicle</u> wherein the electrical <u>data processing</u> system or calculating computer is designed to control, guide, or operate the <u>vehicle</u> by information received as an optical signal.

SEE OR SEARCH CLASS:

348,   Television, subclasses 113+ for a picture signal generator or reproducer used with a steerable <u>vehicle</u> to permit control of the <u>vehicle</u> from a remote location or to provide an indication in the <u>vehicle</u> of its position as an aid in the guidance of the <u>vehicle</u>.

382,   Image Analysis, appropriate subclass for an apparatus or corresponding method for the automated analysis of an image or recognition of a pattern.

29   Vehicle diagnosis or maintenance indication:
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the electrical data processing system or calculating computer is designed to evaluate, monitor, or indicate the performance, operating condition, or servicing need of a vehicle.

30   Indication of maintenance interval:
This subclass is indented under subclass 29. Vehicle diagnosis or maintenance indication wherein the electrical data processing system or calculating computer determines and communicates to an interested party, a need for vehicle servicing based on a constraint parameter (e.g., time, operating condition or vehicle millage).

31   Self-test:
This subclass is indented under subclass 29. Vehicle diagnosis or maintenance indication wherein the electrical data processing system or calculating computer functions to check the diagnostic equipment or elements within said system, absent any external device.

32   Vehicle or device ID:
This subclass is indented under subclass 29. Vehicle diagnosis or maintenance indication wherein the electrical data processing system or calculating computer generates a signal identifying the vehicle (i.e., make, model, year of manufacture, etc.) or vehicular component to be diagnosed.

33   Plural processors or external processor:
This subclass is indented under subclass 29. Vehicle diagnosis or maintenance indication wherein the diagnosis or indication process is facilitated by multiple processors or a remote processor.

34   Detection of faulty sensor:
This subclass is indented under subclass 29. Vehicle diagnosis or maintenance indication wherein the electrical data processing system or calculating computer functions to identify a malfunction of a vehicle sensor.

35   With data recording device:
This subclass is indented under subclass 29. Subject matter in which the sensed vehicular condition parameter or diagnostic result is stored in a recording medium.

36   Vehicle subsystem or accessory control:
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the electrical data processing system or calculating computer is designed to control, guide, or operate a secondary vehicle structure.

(1)   Note. This subclass is inclusive of such systems as air conditioning, power steering, seat adjustment, and suspension.

37   Suspension control:
This subclass is indented under subclass 36. Vehicle subsystem or accessory control wherein the electrical data processing system or calculating computer is designed to control the resilient mechanism, used primarily for ride stability, located between the ground engaging means and the vehicle frame.

SEE OR SEARCH CLASS:
73,   Measuring and Testing, subclasses 11.04+ for testing of shock absorber device.
105,   Railway Rolling Stock, subclass 453 for body suspension and springs.
180,   Motor Vehicles, appropriate subclass, especially subclasses 337+ for a vehicle suspension system in combination with a drive train or transmission.
187,   Elevators, Industrial Lift Truck, or Stationary Lift for Vehicle, subclasses 187+ for cushioning contact of load support.
267,   Spring Devices, subclasses 2+   for vehicle spring suspension devices.
280,   Land Vehicles, appropriate   subclasses, particularly subclasses 5.5+ for a general utility land vehicle including an active suspension system having a regulatable elastic means which is caused to alter its elasticity property in response to a force encountered while the vehicle is in surface traversing motion; subclasses 6.15+ for a general utility land vehicle including means, interposed between the vehicle body, chassis, or frame and running gear thereof, for altering height or levelness of the vehicle body, chassis, or frame; subclass 47.22 for a handle-propelled tiltable vehicle stabilized by the attendant or article and having a spring suspension; subclass 124.1+ for a suspension arrangement for a general utility land vehicle, in particular subclasses 124.125+ for a land vehicle suspen-

sion arrangement including a wheel separately supported upon an individual stub axle; subclass 402 for a single end suspension of a transported articulated land vehicle; subclasses 676+ for a general utility land vehicle having an equalized frame, tandem axles, and a suspension arrangement; subclass 787 for a land vehicle frame of the single longitudinal beam type with spring suspension means; and subclass 788 for a land vehicle frame with resilient means for suspension.

38   **Attitude change suppressive control (e.g., antiroll or antipitch):**

This subclass is indented under subclass 37. Suspension control the electrical <u>data processing</u> system or calculating computer is designed to control a <u>vehicle</u> with respect to movement about a lateral axis or movement with respect to a lateral axis.

SEE OR SEARCH CLASS:
104,   Railways, subclass 284 for sensing or controlling of railway position or <u>attitude</u> with respect to a guide way.
280,   Land Vehicles, appropriate subclasses, particularly subclasses 5.5+ for a general utility land vehicle including an active suspension system which alters its elasticity during travel to control the attitude of the vehicle.

39   **Fail-safe system:**

This subclass is indented under subclass 37. Suspension control wherein the electrical <u>data processing</u> system or calculating computer is designed to detect an abnormality in operating conditions and carry out the appropriate sequence of instructions to stabilize the system.

SEE OR SEARCH CLASS:
708,   Electrical Computers: Arithmetic Processing and Calculating, subclasses 530+ for an electric digital calculating computer having a specialized function of error detection or correction.
714,   Error Detection/Correction and Fault Detection/Recovery, subclasses 2+ for apparatus fault recovery and fail-safe shutdown.

40   **Artificial intelligence (e.g., fuzzy logic):**

This subclass is indented under subclass 37. Suspension control wherein the electrical <u>data processing</u> system or calculating computer is designed to control, guide, or operate the <u>vehicle</u> by the manipulation of a value of a predetermined function of antecedent and consequent operations corresponding to the state of the suspension system.

41   **Steering control:**

This subclass is indented under subclass 36. Vehicle subsystem or accessory control wherein the electrical data processing system or calculating computer is designed to control or monitor either (a) a direction of travel, b) the yaw of a vehicle, or (c) a force applied to or exerted by a vehicle navigational system.

SEE OR SEARCH CLASS:
105,   Railway Rolling Stock, subclass 4.4 for train having a wheel steering provision.
114,   Ships, subclasses 144+ for ship steering mechanisms.
116,   Signals and Indicators, subclass 31 for a <u>vehicle</u> steering wheel position indicator.
180,   Motor Vehicles, appropriate subclass, especially subclasses 6.2+ for steering by driving systems and 234+ for steering of four wheel drive <u>vehicles</u>, 408+ for a <u>vehicle</u> having each wheel steerable, 410 for condition modulated steering, and 443+ for electric power assist steering.
187,   Elevators, Industrial Lift Truck, or Stationary Lift for Vehicle, subclass 231 for industrial lift truck steering by a walking attendant.
188,   Brakes, subclass 350 for brakes in combination with a steering gear control.
244,   Aeronautics and Astronautics, subclasses 17.17, 50, and 51 for aircraft steering.
280,   Land Vehicles, appropriate subclass for steering a <u>vehicle</u>.
340,   Communications: Electrical, subclass 465 for indicator of steering or turning.

342,   Communications: Directive Radio Wave Systems and Devices (e.g., radar, radio navigator), appropriate subclass especially subclass 71 for return control signal for steering.

440,   Marine Propulsion, subclass 53 for a means effecting or facilitating movement of propulsion unit or a segment of the propulsion unit (e.g., tilting or steering).

42   Feedback, transfer function or proportional and derivative (P&D) control:
This subclass is indented under subclass 41. Steering control wherein the electrical <u>data processing</u> system or calculating computer utilizes a response signal corresponding to the status of the steering system, to regulate or monitor the steering operation or where the system shifts from proportional control to a combination of proportional and derivative control.

43   Fail-safe system:
This subclass is indented under subclass 41. Steering control wherein the electrical <u>data processing</u> system or calculating computer is designed to detect an abnormality in operating conditions and carry out the appropriate sequence of instructions to stabilize the steering system.

SEE OR SEARCH CLASS:
340,   Communication: Electrical, subclass 507 for a fail-safe responsive indicating system.
708,   Electrical Computers: Arithmetic Processing and Calculating, subclasses 530+ for an electric digital calculating computer having a specialized function of error detection or correction
714,   Error Detection/Correction and Fault Detection/Recovery, subclasses 2+ for a fail-safe fault recovery apparatus.

44   Artificial intelligence (e.g., fuzzy logic):
This subclass is indented under subclass 41. Steering control wherein the electrical <u>data processing</u> system or calculating computer is designed to control, guide, or operate the <u>vehicle</u> by the manipulation of a value of a predetermined function of antecedent and consequent operations corresponding to the state of the steering system or by inexact reasoning implemented using set membership functions.

45   Control of vehicle safety devices (e.g., airbag, seat-belt, etc.):
This subclass is indented under subclass 36. Vehicle subsystem or accessory wherein the electrical data processing system or calculating computer is designed to control or monitor a system dedicated for the protection or security of a vehicle, its passengers, or cargo.

(1)   Note. This subclass includes art related to the control of air bags, seat belts, restraint systems, etc.

SEE OR SEARCH CLASS:
180,   Motor Vehicles, subclasses 271+ for a with means for promoting safety of <u>vehicle</u>, its occupant, or load, or an external object.
280,   Land Vehicles, subclasses 734+ for an inflatable passenger restraint or confinement (e.g., air bag) or attachment responsive to a <u>vehicle</u> condition.
340,   Communication: Electrical, subclasses 436+ for a system designed to indicate contact between the <u>vehicle</u> and an external object and 903 for a <u>vehicle</u> collision alert system.

46   By integrating the amplitude of the input signal:
This subclass is indented under subclass 45. Vehicle safety device control further comprising activation of the safety device responsive to an input integrated signal exceeding a predetermined system condition threshold value.

47   By frequency or waveform analysis:
This subclass is indented under subclass 45. Vehicle safety device control further comprising activation of the safety device responsive to a vibratory electric signal, having various frequency components, indicating an unsafe vehicle condition.

48   Cooperative or multiple control (e.g., suspension and braking):
This subclass is indented under subclass 36. Vehicle subsystem or accessory wherein the electrical data processing system or calculating computer is designed to control or monitor

more than one subsystem or accessory, each being in direct or indirect communication with the other.

49   Vehicle equipment position control (e.g., seat, mirror, door, window, headrest or headlamp):
This subclass is indented under subclass 36. Vehicle subsystem or accessory wherein the electrical data processing system or calculating computer is designed to control or monitor the location, orientation, or movement of an apparatus.

50   Construction or agricultural vehicle type (e.g., crane, forklift):
This subclass is indented under subclass 1. Subject matter providing control of a <u>vehicle</u> used in construction or farming and particularly the control of a special purpose implement associated with such a <u>vehicle</u>.

(1)   Note. This subclass includes control of the boom of a crane, the fork of a forklift, etc.

51   Transmission control:
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the electrical data processing system or calculating computer functions to regulate or monitor the operation of the transmission.

SEE OR SEARCH THIS CLASS, SUBCLASS:
87,   for control of transmission torque to regulate the <u>antispin</u> behavior of a <u>vehicle</u>.

SEE OR SEARCH CLASS:
74,   Machine Element or Mechanism, subclasses 473.1+ for a system to manually control a transmission.
91,   Motors: Expansible Chamber Type, subclass 473 for condition responsive control of drive transmission.
92,   Expansible Chamber Devices, subclasses 12.1+ for displacement control of plural cylinders arranged in parallel, radial, or conical relationship with rotary transmission axis.
180,   Motor Vehicles, subclass 336 for manually controlling the motor or

driving mechanism with transmission control and 337+ for a transmission mechanism.
192,   Clutches and Power-Stop Control, subclasses 3.51+ for transmission control and clutch control and 215+ for control of transmission and brake.
440,   Marine Propulsion, subclasses 84+ for an engine, motor, or transmission control means.
477,   Interrelated Power Delivery Controls Including Engine Control, subclasses 15+ for an electric engine with transmission control, 31 for a continuously variable transmission with a gas turbine engine, and 34+ wherein the operation of an engine regulates or is regulated by the operation of a transmission.

52   Semiautomatic control (e.g., switchable between automatic and manual):
This subclass is indented under subclass 51. Transmission control wherein the electrical <u>data processing</u> system or calculating computer functions in concert with a selectable mode transmission (e.g., gear ratio selected manually by the <u>vehicle</u> operator or automatically according to operating conditions of the transmission system).

53   And other vehicle control:
This subclass is indented under subclass 51. Transmission control wherein the electrical <u>data processing</u> system or calculating computer is designed to integrally control the transmission in conjunction with another <u>vehicle</u> control system.

SEE OR SEARCH THIS CLASS, SUBCLASS:
87,   for <u>antispin</u> control by regulating the torque of a transmission.
95,   for regulating <u>vehicle</u> speed by transmission shift control.

54   Engine output control:
This subclass is indented under subclass 53. Integrated control system wherein the electrical <u>data processing</u> system or calculating computer further comprises a means to regulate the output torque, power, or speed of the <u>vehicle</u> power plant.

55   By changing shift map, schedule, or pattern:
This subclass is indented under subclass 51. Transmission control wherein the electrical <u>data processing</u> system or calculating computer regulates the gear selection of the transmission by selecting or modifying a stored set of schemes used for proper gear selection.

56   Having a plurality of preset maps, schedules, or patterns:
This subclass is indented under subclass 55. Transmission control having multiple stored gear selection schemes.

57   Fuzzy logic:
This subclass is indented under subclass 51. Transmission control wherein the electrical <u>data processing</u> system or calculating computer is designed to control or regulate the transmission by inexact reasoning implemented using set membership functions.

SEE OR SEARCH CLASS:
706,   Data Processing: Artificial Intelligence, subclasses 1 through 9 for fuzzy logic hardware, subclasses 45-61 for a knowledge processing system, and cross-reference art collection 900 relating to fuzzy logic.

58   Adaptive control:
This subclass is indented under subclass 51. Transmission control wherein the electrical <u>data processing</u> system or calculating computer is designed to compensate, in the course of its operation, for variations in operating characteristics of the <u>vehicle</u>.

SEE OR SEARCH CLASS:
700,   Data Processing: Generic Control Systems or Specific Applications, subclasses 28 through 55 for a control which seeks to optimize a system's performance criterion (e.g., efficiency, consumption, or profit).

59   Model or learning means (e.g., neural network):
This subclass is indented under subclass 58. Adaptive control wherein stored historical data, or data relating to present operating conditions, is used to modify the operating parameters of the transmission.

SEE OR SEARCH CLASS:
700,   Data Processing: Generic Control Systems or Specific Applications, subclass 29 for a data processing control system having a mathematical model.
706,   Data Processing: Artificial Intelligence, subclasses 12 and 13 for artificial intelligence machine learning; subclass 14 for artificial intelligence adaptive systems; subclasses 15-44 for neural networks, in general; and cross-reference art collection 905 for detailed artificial intelligence applied to vehicle control.

60   Feedback control (e.g., closed loop):
This subclass is indented under subclass 58. Adaptive control wherein input for the compensation means is a response signal corresponding to the status of the transmission system.

61   Using a transmission ratio as feedback control:
This subclass is indented under subclass 60. Feedback control wherein the response signal is determine to be the ratio between the transmission input and output shaft speeds.

62   Fail-safe control (e.g., preventing a gear shift):
This subclass is indented under subclass 51. Transmission control wherein the electrical <u>data processing</u> system or calculating computer is designed to detect an abnormality in operating conditions and carry out or modify the appropriate sequence of instructions to stabilize operation of the transmission.

SEE OR SEARCH CLASS:
708,   Electrical Computers: Arithmetic Processing and Calculating, subclasses 530+ for an electric digital calculating computer having a specialized function of error detection or correction

63   Responsive to faulty sensor:
This subclass is indented under subclass 62. Fail safe control wherein the abnormal condition exist in a device for detecting an operating characteristic of the <u>vehicle</u>.

64   **Indicating a completion of a shift or a shift to be completed:**

This subclass is indented under subclass 51. Transmission control further comprising a means to exhibit the completion of a particular shift or to alert the operator of the proper timing to optimize shift execution.

65   **Responsive to road, external, or ambient condition:**

This subclass is indented under subclass 51. Transmission control wherein the electrical data processing system or calculating computer is designed to compensate, in the course of its operation, for variations in conditions external to the vehicle.

66   **Time regulated operations:**

This subclass is indented under subclass 51. Transmission control wherein the electrical data processing system or calculating computer is designed to either receive or deliver instructional signals at a particular point in time, or within a set time period, for synchronizing the operation of a transmission with the operation of a secondary mechanism.

67   **Clutch control:**

This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the electrical data processing system or calculating computer functions to control or monitor the operation of the device which enables the coupling of two working parts in such a way as to permit connection or disconnection at will, without the necessity of bringing both parts to rest.

SEE OR SEARCH CLASS:
192,   Clutches and Power-Stop Control, subclasses 3.51+ for clutches and power-stop control.
475,   Planetary Gear Transmission Systems or Components, subclass 43 for a transmission with speed or torque responsive clutch.
477,   Interrelated Power Delivery Controls Including Engine Control, subclasses 5 and 6 for plural engines have clutch control, 8 for an electric engine with clutch control, 39 for a continuously variable friction transmission with clutch control, 57, 62, and 70+ for

transmission control and clutch control, and 166+ for clutch control, per se.

68   **Adaptive control:**

This subclass is indented under subclass 67. Clutch control wherein the electrical data processing system or calculating computer is designed to compensate in the course of its operation for variations in operating characteristics.

SEE OR SEARCH THIS CLASS, SUBCLASS:
58,   for adaptive transmission control.

SEE OR SEARCH CLASS:
700,   Data Processing: Generic Control Systems or Specific Applications, subclasses 28 through 55 for a control which seeks to optimize a system's performance criterion (e.g., efficiency, consumption, or profit).

69   **Control of power distribution between vehicle axis or wheels (e.g., four wheel drive vehicle):**

This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the electrical data processing system or calculating computer functions to regulate vehicle movement by the connection, disconnection, or transfer of power from a vehicle propelling means to a mechanism having separate outputs driven simultaneously by a member of a planetary gear transmission.

70   **Indication or control of braking, acceleration, or deceleration:**

This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the electrical data processing system or calculating computer functions to regulate the increase or decrease in speed of a vehicle.

SEE OR SEARCH CLASS:
73,   Measuring and Testing, subclasses 121+ for brake testing excluding data processing techniques.
188,   Brakes, for brake control which includes specific structure to the brakes; in particular, subclasses 137+ for an electrically controlled braking

system and 182 for fluid-pressure and electric-operated brakes.

303,   Fluid-Pressure and Analogous Brake System, subclasses 121+ for speed control which includes specific structure to fluid-pressure brakes.

340,   Communications: Electrical, subclass 52 for means responsive to vehicular brake conditions and indication void <u>data processing</u> techniques.

71   Antiskid, antilock, or brake-slip control:
This subclass is indented under subclass 70. Braking, acceleration, or deceleration control wherein the electrical <u>data processing</u> system or calculating computer utilizes information received concerning <u>vehicle</u> speed, wheel speed, or any derivatives thereof in determining activation of the appropriate speed altering action to control an undesired sliding, binding, or engagement of a <u>vehicle</u>, or its wheel, due to wheel deceleration.

(1)   Note. Skid control is a process of controlling the <u>vehicle</u> to enhance the braking performance during the deceleration of the <u>vehicle</u> by manipulating the brake pressure.

SEE OR SEARCH THIS CLASS, SUBCLASS:
82+,   for undesired <u>vehicle</u> wheel spinning control wherein such spinning is caused by excessive wheel acceleration.

SEE OR SEARCH CLASS:
180,   Motor Vehicles, subclass 197 for traction control systems combined with vehicular structure.
280,   Land Vehicles, subclasses 757+ for an attachment relating to antiskid or antislide.
303,   Fluid-Pressure Brake and Analogous Systems, subclasses 139+ for traction control which includes specific structure to fluid-pressure brakes.
361,   Electricity: Electrical Systems and Devices, subclass 238 for electrical speed signal circuitry used for <u>antiskid</u>/<u>antilock</u> detection void of significant <u>data processing</u> techniques.

72   During cornering or turning of vehicle:
Antiskid or antilock control under 71 wherein the electrical data processing system or calculating computer regulates the speed of a vehicle when a lateral acceleration or yaw condition is detected or sensed.

SEE OR SEARCH CLASS:
303,   Fluid-Pressure Brake and Analogous Systems, subclasses 146+ for specific structure to fluid-pressure brakes including yaw control.

73   On split coefficient surface (m):
Antiskid or antilock control under 71 wherein the electrical data processing system or calculating computer regulates the brake pressure of a vehicle when it is sensed to experience a varying degree of adhesion along the traveled surface.

SEE OR SEARCH CLASS:
303,   Fluid-Pressure Brake and Analogous Systems, subclass 149 for speed control with a split coefficient of friction.

74   Having particular means to determine a reference value for wheel slippage or pseudo-vehicle speed:
Antiskid or antilock control under 71 wherein the electrical data processing system or calculating computer employs a technique to calculate a value associated with a velocity or velocity variation gradient for use in determining a skidding or locking condition.

SEE OR SEARCH CLASS:
303,   Fluid-Pressure Brake and Analogous Systems, subclass 163 for speed control using a <u>slip</u> ratio as related to fluid-pressure brakes.

75   Correction or modification:
This subclass is indented under subclass 74. Determining means further comprising a substitution means or compensation means for changing the reference value or pseudo <u>vehicle</u> speed.

76   Fail-safe system:
This subclass is indented under subclass 71. Antiskid or antilock control wherein the electrical data processing system or calculating

computer is designed to detect an abnormality in operating conditions and carry out the appropriate sequence of instructions to stabilize vehicle braking, acceleration, or deceleration.

SEE OR SEARCH CLASS:
303,   Fluid-Pressure Brake and Analogous Systems, subclasses 122.02+   for antilock brake failure with warning.
340,   Communication: Electrical, subclass 507 for a fail-safe responsive indicating system.
708,   Electrical Computers: Arithmetic Processing and Calculating, subclasses 530+ for an electric digital calculating computer having a specialized function of error detection or correction
714,   Error Detection/Correction and Fault Detection/Recovery, subclasses 2+, for a fail-safe fault recovery apparatus.

77   **Artificial intelligence (e.g., fuzzy logic):**
This subclass is indented under subclass 71. Antiskid or antilock control wherein the electrical data processing system or calculating computer is designed to indicate information or control the vehicle by the manipulation of a value of a predetermined function of antecedent and consequent operations corresponding to the state of the braking, acceleration, or deceleration of the vehicle.

78   **Control of brake pressure:**
This subclass is indented under subclass 71. Antiskid or antilock control wherein the electrical data processing system or calculating computer is designed to control the braking, acceleration, or deceleration of a vehicle by regulation of a fluid pressure exerted by the braking system.

SEE OR SEARCH CLASS:
188,   Brakes, appropriate subclasses for a means of retarding the motion of or stopping machines, including vehicles.
303,   Fluid-Pressure Brake and Analogous Systems, subclass 167 for vehicle speed control by regulating brake pressure not having a positive recitation of data processing steps.

79   **Having speed variation responsive means (e.g., acceleration, deceleration):**
This subclass is indented under subclass 78. Brake pressure control wherein the control of the brake pressure is regulated by the change in velocity or a change in the sensed velocity of the vehicle.

80   **Having coefficient of friction or road condition determining means:**
This subclass is indented under subclass 78. Brake pressure control wherein the control of the brake pressure is regulated by variations in the gradient or texture of the traveling surface.

81   **Four wheel drive, electric, or heavy vehicles:**
This subclass is indented under subclass 78. Brake pressure control wherein the control of the brake pressure is specifically designed for vehicles characterized as one of either (a) having driving means in direct connection with four wheels of the vehicle, (b) having an electrical prime mover, or (c) vehicles catagorize as large machinery (i.e. heavy duty).

82   **Antispin, traction control, or drive slip control:**
This subclass is indented under subclass 70. Braking, acceleration or deceleration control wherein the electrical data processing system or calculating computer utilizes information received concerning vehicle speed, wheel speed, or any derivative thereof in determining activation of the appropriate speed altering action to control an undesired rotation of a vehicle's wheel due to wheel acceleration.

(1)   Note. Spin control is the process of controlling the vehicle to enhance the driveability of the vehicle during starting or acceleration of the vehicle by manipulating at least one of (a)brake pressure, (b) engine torque, or (c) transmission torque.

SEE OR SEARCH THIS CLASS, SUBCLASS:
71,   for undesired vehicle wheel skidding or locking control wherein such skidding or locking is caused by excessive wheel deceleration.

SEE OR SEARCH CLASS:
180,   Motor Vehicles, subclass 197 for anti-spin systems combined with vehicular structure.
303,   Fluid-Pressure Brake and Analogous Systems, subclasses 91+ for antispin control which includes specific structure to fluid-pressure brakes.
361,   Electricity: Electrical Systems and Devices, subclass 238 for electrical speed signal circuitry used for antispin detection and which does not include significant data processing techniques.

83   Control of brake pressure:
This subclass is indented under subclass 82. antispin, traction control or drive slip control wherein the electrical data processing system or calculating computer is designed to control the braking, acceleration, or deceleration of a vehicle by regulation of a fluid pressure exerted by the braking system.

SEE OR SEARCH CLASS:
188,   Brakes, appropriate subclasses for a means of retarding the motion of or stopping machines, including vehicles.
303,   Fluid-Pressure Brake and Analogous Systems, subclass 167 for vehicle speed control by regulating brake pressure not having a positive recitation of data processing steps.

84   Control of engine torque:
This subclass is indented under subclass 82. antispin, traction control, or drive slip control wherein the electrical data processing system or calculating computer is designed to control the braking, acceleration, or deceleration of a vehicle by regulation of the engine output power.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
110,   for internal-combustion engine control or indication wherein a digital or programmed data processing system is designed to include the regulation of the vehicle speed, acceleration or deceleration.

SEE OR SEARCH CLASS:
123,   Internal-Combustion Engines, subclasses 320+ for engine speed regulators responsive to vehicle acceleration or deceleration.
303,   Fluid-Pressure Brake and Analogous Systems, subclass 141 for speed and traction control by regulating the engine torque.
477,   Interrelated Power Delivery Controls, Including Engine Control, subclasses 182+ for engine brake control responsive to engine speed.

85   Having throttle valve positioning:
This subclass is indented under subclass 84. Engine torque control wherein the engine torque control is implemented by varying the cross-sectional area of fuel flow by partially closing or opening a damper, gate, or other flow regulator.

86   Having fuel cutting or ignition timing retarding:
This subclass is indented under subclass 84. Engine torque control wherein the engine torque control is implemented by the regulation of fuel supply to the engine or by the adjustment of the ignition timing.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
110,   for internal-combustion engine control or indication wherein a digital or programmed data processing system is designed to restrict fuel flow in response to a sense a stop condition or an emergency condition of the engine.

87   Control of transmission torque:
This subclass is indented under subclass 82. Antispin, traction control, or drive slip control wherein the electrical data processing system or calculating computer is designed to control the braking, acceleration, or deceleration of a vehicle by regulation of power transfer to a driving mechanism.

SEE OR SEARCH CLASS:
192,   Clutches and Power-Stop Control, subclass 137 for a safety device in which the power-transmitting connections are disabled in response to the

transmission guard striking an extraneous object.

88   Restricting differential operation:
This subclass is indented under subclass 82. Antispin, traction control, or drive slip control wherein the electrical data processing system or calculating computer is designed to control the braking, acceleration, or deceleration of a vehicle by independently regulating the output torque to the wheels of the vehicle.

89   Four wheel drive vehicle:
This subclass is indented under subclass 82. Antispin, traction control, or drive slip control wherein the electrical data processing system or calculating computer is designed to control the braking, acceleration, or deceleration of a four wheel drive vehicle.

90   Having particular slip threshold, target slip ratio, or target engine torque determining means:
This subclass is indented under subclass 82. Antispin, traction control, or drive slip control wherein the electrical data processing system or calculating computer further is capable of determining a reference parameter and utilizing said parameter to determine the undesired condition of excessive wheel spinning due to vehicle acceleration.

91   Integrated with antiskid or other vehicle control system (e.g., cruise control, suspension):
This subclass is indented under subclass 82. Antispin, traction control, or drive slip control wherein the electrical data processing system or calculating computer operates in conjunction with another vehicle control system to effectively control the undesired condition of excessive wheel spinning due to vehicle acceleration.

92   Fail-safe system:
This subclass is indented under subclass 82. Antispin, traction control, or drive slip control wherein the electrical data processing system or calculating computer is designed to detect an abnormality in operating conditions and carry out the appropriate sequence of instructions to stabilize traction control.

SEE OR SEARCH CLASS:
303,   Fluid-Pressure Brake and Analogous Systems, subclasses 122+ for speed controlled <u>vehicle</u> with failure responsive means.
340,   Communication: Electrical, subclass 507 for a fail-safe responsive indicating system.
708,   Electrical Computers: Arithmetic Processing and Calculating, subclasses 530+ for an electric digital calculating computer having a specialized function of error detection or correction.
714,   Error Detection/Correction and Fault Detection/Recovery, subclasses 2+, for a fail-safe fault recovery apparatus.

93   Vehicle speed control (e.g., cruise control):
This subclass is indented under subclass 70. Braking, acceleration, or deceleration control wherein the electrical <u>data processing</u> system or calculating computer is designed to maintain <u>vehicle</u> velocity at a specified value.

SEE OR SEARCH THIS CLASS, SUBCLASS:
110,   for internal-combustion engine speed control by digital processing techniques.

SEE OR SEARCH CLASS:
123,   Internal-Combustion Engines, subclasses 350+ for electrical sensing or regulating of engine speed.
180,   Motor Vehicles, subclasses 170+ for a <u>vehicle</u> with speed responsive means.

94   Having gradient responsive control to suppress hunting, overshooting, or undershooting:
This subclass is indented under subclass 93. Vehicle speed control further comprising a means to regulate the shift in response to an impulsive momentary change in vehicle speed caused by the slope, or change in the slope, of a traveling surface.

95   By transmission shifting control:
This subclass is indented under subclass 94. Gradient response wherein the means to regulate the impulsive momentary change in <u>vehicle</u> speed is executed by varying the gear ratio

as a means to transfer power to a driving mechanism.

96   Having inter-vehicle distance or speed control:
This subclass is indented under subclass 93. Vehicle speed control wherein vehicle velocity is regulated in response to a detected velocity or a measured separation of a second vehicle relative to a first vehicle.

SEE OR SEARCH THIS CLASS, SUBCLASS:
300+,   for determining a spacial relationship between two <u>vehicle</u>s.

97   Fail-safe system:
This subclass is indented under subclass 93. Vehicle speed control wherein the electrical data processing system or calculating computer is designed to detect an abnormality in operating conditions and carry out the appropriate sequence of instructions to stabilize vehicle speed.

SEE OR SEARCH CLASS:
303,   Fluid-Pressure Brake and Analogous Systems, subclasses 122+ for speed controlled <u>vehicle</u> with failure responsive means.
340,   Communication: Electrical, subclass 507 for a fail-safe responsive indicating system.
708,   Electrical Computers: Arithmetic Processing and Calculating, subclasses 530+ for an electric digital calculating computer having a specialized function of error detection or correction.
714,   Error Detection/Correction and Fault Detection/Recovery, subclasses 2+, for a fail-safe fault recovery apparatus.

98   Artificial intelligence (e.g., fuzzy logic):
This subclass is indented under subclass 93. Vehicle speed control wherein the electrical data processing system or calculating computer is designed to indicate information or control the vehicle by the manipulation of a value of a predetermined function of antecedent and consequent operations corresponding to vehicle speed.

SEE OR SEARCH CLASS:
706,   Data Processing: Artificial Intelligence, appropriate subclasses for artificial intelligence, in general; cross-reference art collection 900 relating to fuzzy logic; and cross-reference art collection 905 for detailed artificial intelligence applied to vehicle control.

99   With indication or control of power plant (e.g., performance):
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the data processing system or calculating computer controls, indicates, or monitors the prime mover of the vehicle.

(1)   Note. This subclass includes the performance of a power plant.

100   Gas turbine, compressor:
This subclass is indented under subclass 99. Indication or control of power plant wherein the power plant is a gas turbine which may include a compressor.

SEE OR SEARCH CLASS:
415,   Rotary Kinetic Fluid Motors or Pumps, subclasses 13+ for control means responsive to condition sensing.

101   Internal-combustion engine:
This subclass is indented under subclass 99. Indication or control of power plant wherein the power plant is an internal-combustion engine.

SEE OR SEARCH CLASS:
123,   Internal-Combustion Engines, wherein significant structure of an internal-combustion engine is claimed, in particular, subclasses 406.12+ for electronic timing control; and subclasses 438+ for a charge forming device which includes an electronic control system.

102   Digital or programmed data processor:
This subclass is indented under subclass 101. Internal-combustion engine controlled digitally or by a programmed data processor.

SEE OR SEARCH CLASS:
123, Internal-Combustion Engines, sub-
classes 406.12+ for electronic ignition
timing control.

103 Control of air/fuel ratio or fuel injection:
This subclass is indented under subclass 102.
Control system wherein the digital or pro-
grammed data processing system is designed to
control the air/fuel ratio or the injection of fuel
based on engine operating conditions or envi-
ronmental conditions.

SEE OR SEARCH CLASS:
123, Internal-Combustion Engines, sub-
class 406.45 for electronic control of
combustible mixture or a constituent
thereof, subclass 480 for fuel injection
which includes a microprocessor, and
subclass 486 for digital memory
addressed by an engine parameter.

104 Controlling fuel quantity:
This subclass is indented under subclass 103.
Control system wherein the air/fuel ratio or
fuel injection is controlled by modifying the
supply of fuel to the combustion engine.

SEE OR SEARCH CLASS:
123, Internal-Combustion Engines, sub-
classes 406.45+ for electronic control
of combustible mixture or a constitu-
ent thereof, subclass 429 for a com-
bustion chamber means combined
with air-fuel mixture forming means,
subclasses 478+ for a fuel injection
system having an actuator circuit
(e.g., engine condition responsive
electronic circuit actuates injector
valve), and subclasses 575+ for a
means of forming a mixture of a
diverse supply of fuel and an oxidant.

105 Controlling timing:
This subclass is indented under subclass 103.
Control system wherein the air/fuel ratio or
fuel injection is controlled in response to the
synchronization operation associated with the
combustion or the ignition.

SEE OR SEARCH CLASS:
123, Internal-Combustion Engines, sub-
classes 406.11+ for spark ignition
timing control.

106 Artificial intelligence (e.g., fuzzy logic):
This subclass is indented under subclass 103.
Control system wherein the digital or pro-
grammed data processing system is designed to
indicate information or control the air/fuel ratio
or fuel injection by the manipulation of a value
of a predetermined function of antecedent and
consequent operations corresponding to the
operating conditions of the combustion engine.

SEE OR SEARCH CLASS:
706, Data Processing: Artificial Intelli-
gence, appropriate subclasses for arti-
ficial intelligence, in general; cross-
reference art collection 900 relating to
fuzzy logic; and cross-reference art
collection 905 for detailed artificial
intelligence applied to vehicle control.

107 Fail-safe system:
This subclass is indented under subclass 103.
Control system wherein the digital or pro-
grammed data processing system is designed to
detect an abnormality in operating conditions
and carry out the appropriate sequence of
instructions to stabilize the air/fuel ratio or fuel
injection operation.

SEE OR SEARCH CLASS:
123, Internal-Combustion Engines, sub-
classes 395+ for an engine speed reg-
ulator responsive to (a) an engine
parameter or (b) an environmental
condition to alter the present engine
speed without regard to the resulting
engine speed, subclasses 406.13+ for
a spark ignition timing regulator
which includes upon detecting failure
in a circuit or circuit element (a) shifts
operation (1) into a substitute circuit
or (2) to a substitute mechanism to
accomplish the same function or (b)
indicates functioning of the circuit or
circuit element outside of accepted
parameters, subclass 479 for a fail
safe fuel injector system, and subclass
690 for a charge forming device with
fail-safe, backup, or malfunction

means including an exhaust gas condition responsive means.

708,   Electrical Computers: Arithmetic Processing and Calculating, subclasses 530+ for an electric digital calculating computer having a specialized function of error detection or correction.

108   Exhaust gas circulation (EGC):
This subclass is indented under subclass 103. Control system wherein the air/fuel ratio or fuel injection is controlled in response to a change in the exhaust gas system.

SEE OR SEARCH CLASS:
123,   Internal-Combustion Engines, subclasses 568.21+ for the electrical control of an e.g.r. valve for a charge forming device and subclasses 672+ for a charge forming device including an exhaust gas sensing means.

109   Detection of O$_2$ concentration:
This subclass is indented under subclass 103. Control system wherein the exhaust gas circulation is controlled or modified in response to a sensed oxygen content in the exhaust gas.

SEE OR SEARCH CLASS:
123,   Internal-Combustion Engines, subclasses 531+ for a charge forming device using auxiliary air or gas to inject fuel and 585+ for a charge forming device having auxiliary air or oxygen added to combustible mixture.

110   Speed, acceleration, deceleration:
This subclass is indented under subclass 102. Internal-combustion engine control or indication wherein the digital or programmed data processing system is designed to include the regulation of the vehicle speed, acceleration, or deceleration.

SEE OR SEARCH THIS CLASS, SUBCLASS:
84,   for the control of engine torque for the purpose of controlling the antilock/antiskid of a vehicle.
93,   for vehicle speed control.

SEE OR SEARCH CLASS:
123,   Internal-Combustion Engines, subclasses 406.24+ for regulating means responsive to sudden variations in the rate of rotation of the engine output shaft, subclasses 406.59+ for speed responsive timing control and subclasses 406.25, 406.36, 406.5+, 492, and 493 for acceleration/deceleration responsive means.

111   Vibration, roughness, knock:
This subclass is indented under subclass 102. Internal-combustion engine control or indication wherein the digital or programmed data processing system is designed to control or sense vibration, roughness, or knocking condition of the engine.

SEE OR SEARCH CLASS:
73,   Measuring and Testing, subclasses 116+ for motor or engine testing.
123,   Internal Combustion Engines, subclass 406.16 for a knock control malfunction response system, subclass 406.21 for a closed loop feedback control of spark timing responsive to engine knocks, subclass 406.24 for a closed loop feedback control system responsive to instanteous changes in the engine speed (e.g. roughness, unstable combustion, etc.) and subclass 406.5 for acceleration and deceleration electronic ignition timing control.

112   Engine stop, fuel shutoff:
This subclass is indented under subclass 102. Internal-combustion engine control or indication wherein the digital or programmed data processing system is designed to restrict fuel flow in response to a sense a stop condition or an emergency condition of the engine.

SEE OR SEARCH THIS CLASS, SUBCLASS:
86,   for control of an antiskid or antilock condition by cutting the fuel supply thus controlling the engine torque.

113 Starting, warmup:
This subclass is indented under subclass 102. Internal-combustion engine control or indication wherein the digital or programmed <u>data processing</u> system is designed to sense or control the starting condition or warmup condition of the engine.

SEE OR SEARCH CLASS:
123, Internal-Combustion Engines, subclasses 406.53+ and 491 for the starting or cold running condition of an engine.

114 Backup, interrupt, reset, or test:
This subclass is indented under subclass 102. Internal-combustion engine control or indication wherein the digital or programmed <u>data processing</u> system includes specific structure to function as either a backup, interruption, reset, or test circuit.

SEE OR SEARCH CLASS:
123, Internal-Combustion Engines, subclass 479 for backup systems.
714, Error Detection/Correction and Fault Detection/Recovery, subclasses 724+, for general digital logic testing.

115 Specific memory or interfacing device:
This subclass is indented under subclass 102. Internal-combustion engine control or indication wherein the digital or programmed <u>data processing</u> system includes specific structure to function either as data storage or as an information interconnecting device.

SEE OR SEARCH CLASS:
123, Internal Combustion Engines, subclass 406.33 for a learning system responsive to engine knocking and subclass 406.6+ for speed responsive timing control having a counter or addressable memory.
365, Static Information Storage and Retrieval, appropriate subclasses for memory devices.

116 With indication or control to maintain fixed position:
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the data processing system or cal-

culating computer controls or indicates a particular fixed position of a vehicle with respect to a particular reference.

117 Traffic analysis or control of surface vehicle:
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the data processing system or calculating computer controls or indicates the organized movement of surface vehicles.

SEE OR SEARCH CLASS:
340, Communications: Electrical, subclasses 933+ for <u>vehicle</u>s which are controlled by traffic conditions.

118 With determination of traffic density:
This subclass is indented under subclass 117. Traffic analysis or control of surface <u>vehicle</u> which includes a determination of the number of <u>vehicle</u>s per unit of time that pass a particular point.

119 With determination of traffic speed:
This subclass is indented under subclass 117. Traffic analysis or control of surface <u>vehicle</u> which includes a determination of a distance traveled per unit time for the traffic.

120 Traffic analysis or control of aircraft:
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the data processing system or calculating computer controls or indicates the organized movement of aircraft along particular routes.

SEE OR SEARCH CLASS:
340, Communications: Electrical, subclass 951 for airport control systems which do not include <u>data processing</u> techniques.

121 With speed control or order:
This subclass is indented under subclass 120. Traffic analysis or control of aircraft wherein the <u>data processing</u> system or calculating computer controls or indicates the velocity of the aircraft.

122 With course diversion:
This subclass is indented under subclass 120. Traffic analysis or control of aircraft wherein the <u>data processing</u> system or calculating com-

puter controls or indicates departure from prior course of flight.

123   With indication of fuel consumption rate or economy of usage:
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the data processing system or calculating computer controls or indicates the amount of fuel consumed per unit time or most economical fuel consumption rate or distance available for a given amount of fuel.

124   Determining balance or center of gravity (e.g., load distribution of vehicle):
This subclass is indented under subclass 1. Vehicle control, guidance, operation, or indication wherein the data processing system or calculating computer functions to determine the weight distribution of a vehicle.

SEE OR SEARCH CLASS:
73,   Measuring and Testing, subclasses 65.01+ for measuring and determining the center of gravity, per se, subclasses 66+ for determination of the amount of unbalance of a rotor, and subclass 172 for weight distribution on a human foot.

200   NAVIGATION:
This subclass is indented under the class definition. Subject matter wherein the electrical data processing system or calculating computer functions to determine a course, position, or distance traveled.

(1)   Note. In Class 116, Signals and Indicators, Digest 43, there exists an unofficial collection of art relating to navigation devices.

SEE OR SEARCH THIS CLASS, SUBCLASS:
300,   for an electrical data processing system or a calculating computer to determine the relative location between two points.

SEE OR SEARCH CLASS:
33,   Geometrical Instruments, appropriate subclasses, especially subclasses 300+ for celestial navigational instruments.

73,   Measuring and Testing, subclasses 178+ for navigation.
244,   Aeronautics and Astronautics, subclass 3.18 for celestial navigation.
318,   Electricity: Motive Power Systems, subclass 582 for vehicular guidance systems with celestial navigation.
340,   Communications: Electrical, subclasses 988+ for vehicle position indication.
342,   Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), for specific structure to a radar device, in particular, subclasses 385+ for radio wave energy for direction finding receivers; and subclasses 1 through 205 for radar navigation systems.
348,   Television, subclasses 113+ for a picture signal generator or reproducer which is used with a steerable vehicle to permit control of the vehicle from a remote location or to provide an indication in the vehicle of its position as an aid in the guidance of the vehicle.
353,   Optics: Image Projectors, subclasses 11+ for a projector especially adapted to project an image of a map or navigation chart, an image of a target onto a map or chart, or a target which represents a vehicle such as an aircraft onto a screen.
356,   Optics: Measuring and Testing, subclass 3 for optical range finders and subclasses 27+ for velocity or height measuring.
434,   Education and Demonstration, subclasses 111, 186, and 239+ relating to training or instructions in the area of navigation; subclass 1 for training in the use of radar or sonar detecting or range finding and subclasses 30+ for aircraft training, per se.

201   Determination of travel data based on the start point and destination point:
This subclass is indented under subclass 200. Navigation system wherein the electrical data processing system or calculating computer functions to compute, establish, or indicate travel information associated with the distance measured from a present position to a terminating position.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
25,   for and automatic route guidance system including the storage or planning of route information.

202   **Route pre-planning:**
This subclass is indented under subclass 201. Determination of travel data further comprising a static means to determine a travel course prior to the departure of the <u>vehicle</u>.

203   **Great circle route:**
This subclass is indented under subclass 201. Determination of travel data wherein the course lies along the shortest line between two points on the surface of a sphere.

204   **Determination of E.T.A.:**
This subclass is indented under subclass 200. Navigation system wherein the data processing system or calculating computer functions to determine the time of arrival at a destination.

205   **Determination of along-track or cross-track deviations:**
This subclass is indented under subclass 200. Navigation system wherein the data processing system or calculating computer functions to determine the deviation of a present position from a desired position in a direction parallel to or perpendicular to the course.

206   **Employing way point navigation:**
This subclass is indented under subclass 200. Navigation system wherein the data processing system or calculating computer functions to determine the position relative to an intermediate point between origin and destination.

207   **Employing position determining equipment:**
This subclass is indented under subclass 200. Navigation system wherein the electrical data processing system or calculating computer functions to compute, establish, or indicate the location of a vehicle based on the information provided by the position determining device.

208   **For use in a map data base system:**
This subclass is indented under subclass 207. Positioning determining equipment wherein the <u>vehicle</u> position information is utilized in conjunction with a map information processing data system.

SEE OR SEARCH CLASS:
340,   Communications: Electrical, subclass 990 and subclasses 995.1-995.28 for vehicle position indication with a map display.

209   **Including route searching or determining device:**
This subclass is indented under subclass 208. Map data base system further capable of processing stored electrical data corresponding to locations within a given geographical area to determine a path of travel between a point of origin and a destination point.

210   **Route correction, modification, or verification:**
This subclass is indented under subclass 209. Route searching system wherein the electrical <u>data processing</u> system or calculating computer is designed to either (a) alter the path of travel, (b) determine a supplemental path of travel, (c) provide instructions to resume to the original path of travel, or (d) validate <u>vehicle</u> position or course.

211   **Having audio or visual route guidance:**
This subclass is indented under subclass 208. Map data base system further comprising audio or visual information providing directional instructions to follow a chosen path.

212   **Having variable map scale:**
This subclass is indented under subclass 208. Map data base system further capable of being responsive to a predetermined condition to adjust either (a) the graphical representation of a particular geographic region to an appropriate level of detail or (b) the graphical representation of the <u>vehicle</u> to a specified orientation.

213   **Using Global Positioning System (GPS):**
This subclass is indented under subclass 207. Position determining equipment wherein the electrical <u>data processing</u> system or calculating computer receives positional data via communication with satellites dedicated to a world wide <u>navigational</u> tracking system.

SEE OR SEARCH CLASS:
342,   Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), subclass 357 for sending or receiving radio wave energy which is characterized by some quality that varies according to the relative direction or position of a satellite used to locate the position of an object and 450+ for an apparatus for determining the position in space of an object, <u>vehicle</u>, or atmospheric condition by the reception of signals not having distinctive bearing or position determinative characteristics.

214   **Means to improve accuracy of position or location:**
This subclass is indented under subclass 213. Global positioning system wherein the electrical <u>data processing</u> system or calculating computer utilizes a secondary or supplemental means to more exactly indicate a <u>vehicle</u>'s locale.

215   **Having multiple GPS antennas or receivers (e.g., differential GPS):**
This subclass is indented under subclass 214. Method of correcting position data having a plurality of devices to collect information from satellites associated with a world wide <u>navigational</u> system.

216   **Having a self-contained position computing means (e.g., dead reckoning):**
This subclass is indented under subclass 214. Method of correcting position data having a secondary system for independently calculating or indicating <u>vehicle</u> location for the substitution, modification, or verification of the GPS position data.

SEE OR SEARCH THIS CLASS, SUBCLASS:
217,   for specific secondary system used.

217   **Using dead-reckoning apparatus:**
This subclass is indented under subclass 207. Navigation system wherein position is determined from course and distance made from the last known position and known or estimated drift.

218   **With R-O (D.M.E. and path) or Tacan equipment:**
This subclass is indented under subclass 207. Navigation system having either Tacan or distance and bearing measuring equipment.

219   **With Loran or Shoran or Decca equipment:**
This subclass is indented under subclass 207. Navigation system wherein a position is determined from hyperbolic lines of position.

220   **With inertial sensor:**
This subclass is indented under subclass 207. Navigation system having a means to sense a force caused by acceleration.

221   **With correction by noninertial sensor:**
This subclass is indented under subclass 220. Inertial sensor having a means for correction by sensing a noninertial property.

222   **With star tracker:**
This subclass is indented under subclass 207. Navigation system further comprising a means to determine the position of the stars.

SEE OR SEARCH CLASS:
250,   Radiant Energy, subclass 203 for a photocell following a star.
709,   Electrical Computers and Digital Processing Systems: Multiple Computer or Process Coordinating, FOR 101 for a foreign art collection relating to object detection or tracking.

223   **With radar or optical ground scanner:**
This subclass is indented under subclass 207. Navigation system further comprising a means to scan the ground by radar or optically.

SEE OR SEARCH CLASS:
342,   Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), subclasses 42+ for radar transmitter and receiver system.

224   **With indicated course correction (compass deviation):**
This subclass is indented under subclass 200. Navigation system further comprising a means of notification for modified or corrected course.

225   **Determining range without range measurement:**
This subclass is indented under subclass 200. Navigation system wherein the data processing system or calculating computer functions to determine a travel distance indirectly.

226   **Space orbits or paths:**
This subclass is indented under subclass 200. navigation system wherein the course, path, or position is outside the atmosphere of a planet.

SEE OR SEARCH THIS CLASS, SUBCLASS:
13,   for the control of a spacecraft or satellite.

SEE OR SEARCH CLASS:
244,   Aeronautics and Astronautics, subclasses 158.1 through 173.3   for spacecraft.

300   **RELATIVE LOCATION:**
This subclass is indented under the class definition. Subject matter wherein the data processing system or calculating computer functions to determine the location of one object with respect to a secondary object or point.

301   **Collision avoidance:**
This subclass is indented under subclass 300. Relative location wherein the data processing system or calculating computer functions to determine the relative movement between points for collision avoidance.

302   **Course to intercept:**
This subclass is indented under subclass 300. Relative location wherein the data processing system or calculating computer functions to determine an indication or control action to bring the two points together.

END